SNIFFING OUT AIR QUALITY WITH AN ELECTRONIC NOSE

PHYSICAL SCIENCES RESEARCH
BIOASTRONAUTICS RESEARCH
FUNDAMENTAL SPACE BIOLOGY
SPACE PRODUCT DEVELOPMENT

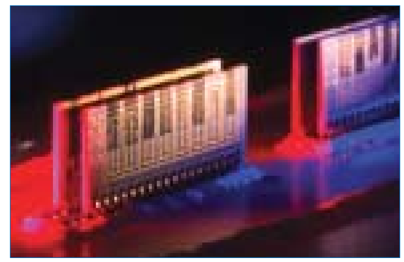
Why is it important?

Air quality monitoring is a priority when operating in closed environments such as the International Space Station (ISS) or many specialized workplaces on Earth. Rapid detection of deadly chemicals or overheating electrical equipment has been done in the past by the crew's collective sense of smell. However, the human nose becomes numb to pungent smells after a short time. We need a reliable nose that is always on duty and never becomes insensitive to dangerous odors.

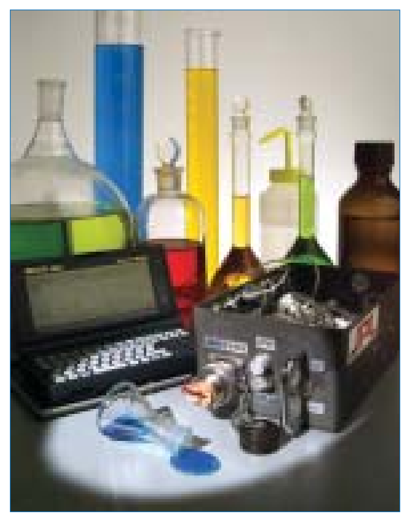
What is NASA doing?

Margaret Amy Ryan and a team of scientists and engineers at NASA's Jet Propulsion Laboratory (JPL) have developed an electronic nose that is similar to our own noses in the way it reacts to certain chemicals. The active parts are 32 sensors, each with a different mix of polymers saturated with carbon. When certain chemicals latch onto a sensor, they change how the sensor conducts electricity. This signal tells how much of a compound is in the air.

The electronic nose flown aboard STS-95 in 1998 was capable of successfully detecting 10 toxic compounds. This device can potentially reduce the health risks for astronauts on the ISS by detecting toxic chemicals; it can also help them determine when the air is breathable again.



ENose sensors (above) and their support system compose a package about the size and weight of a large paperback book. The sensors are tailored to conduct electricity differently when an air stream carries a particular chemical across them. JPL has designed and built a 3-pound flight version (below, with palm-size control and data computer).



What are the benefits?

The electronic nose is an exciting technology with many potential applications on Earth:

- food processing, to monitor food quality and freshness;
- industry, in process and quality control;
- medicine, as diagnostic tools;
- agriculture, as plant growth monitors;
- workplace and environmental safety; and
- bioterrorism early warning.

What is next?

The JPL team is improving the electronic nose in several ways:

- adding 15 compounds to the detection list,
- creating new software to analyze data in a way that classifies the characteristics and class of a compound,
- reducing the mass and volume of ENose to one-half of the version flown on STS-95, and
- increasing sensitivity and extending capability to separate mixtures.

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